Cisco/UDel Meeting Minutes
November 12, 2015

Attendees: Jim Seymour, Len Cimini, Chien-Chung Shen, Li Li
Minutes Taken By: Li Li

Slides #7, #8, #9 – Performance of Delay: Case II, load rate of 0.8

- Li: It is a bit strange that the average delay for WiFi is quite large even at -65 dBm. This is due to the accumulation of packets in the buffer.
- Jim: Even though the percentage of time occupation is similar, the delay for WiFi is much worse than LAA, why?
- Li: At -65 dBm, WiFi #1 and #3 are blocked twice, and LAA #2 and #4 are blocked only once; this means that LAA #2 and $3 can transmit their data out easily. So, the number of packets in the buffer may be always very small, and it is not so lucky for WiFi.
- Jim&Len: Yes, the number of blocks for WiFi is only twice than that of LAA , but the difference in delay is huge, more than 1000 times.
- Li: I am also not sure whether it is correct to calculate the delay in this way, and it is also related to the buffer size.
- Jim: A large buffer is recommended. Do you adopt different modulations for WiFi and LAA? I am still try to figure out why they have a similar percentage of time occupation, but the difference in delay is huge.
- Li: I assume WiFi and LAA have same packet size, same modulations. It is because the buffer for WiFi pairs keeps increasing. For example, there are about 11,000 packets for each pair, a WiFi pair transmits 10,000 packets out, and a LAA pair transmits 11,000 packets out. So, the difference in the percentage of time occupation may be not large. However, there are 1,000 packets in the WiFi buffer, and the delay will be very large. For LAA, there are always only 2 or three packets in the LAA buffer, so the delay is very small.
- Chien-Chung: How many packets are sent out in your simulation?
- Li: In the slides last time, we can see WiFi #1 send 10,465 packets successfully, and LAA #2 send 11,588 packets successfully. So, there are more than 1,000 packets in the WiFi #1's buffer; this contributes to a large delay.
- Len & Jim: Maybe doing average is not a correct way, we can try the following things, like CDF, medium, only look first half of the packets, 10%pecent, 90% and so on.
- Li: One thing is that the buffer will always keep increasing.
- Jim: If so, it means that we are overuse the channel, we need to try a low load rate.

Slides #10 – Performance of Delay: Case II, load rate of 0.5.

- Jim: These results at -65 dBm make more sense. But at -70 dBm, why does LAA #2 increase a lot.
- Li: This is because of the "hidden node" problem: if LAA #2 transmit first, WiFi #3 can still transmit; this may cause a collision. And this is for Case II, I assume that it is only a collision to LAA, not a collision to WiFi.

- Jim: We may also need to consider to have a fair coexistence from the perspective of delay.

Slides #12, #13, #14 – Performance of Delay with RTS/CTS

- Jim: By including RTS/CTS, will LTE understand RTS/CTS?
- Li: No, only WiFi can understand.
- Chien-chung & Li: There are two points: 1) By including RTS/CTS, WiFi will find something wrong at an earlier time, instead of keep sending data at the end. WiFi will backoff earlier, that's the benefit of RTS. 2) The second point is a question. Whether the short RTS will cause a damage to LAA packets?
- Jim: It's possible, since the RTS is so short.
- Li: The problem is that there might exist multiple RTS.
- Jim: Why I do not see collisions between WiFi #1 and LAA #4, even at -75 dBm?
- Li: That's because collisions only happen to RTS for WiFi, I did not count that's a collision to WiFi.

Slides #15 – A problem in the simulation: we may have to consider the impact of interference. Otherwise, the system will prefer high thresholds.

Slides #16 – How to avoid collisions caused by "hidden nodes"? 1) Introducing RTS/CTS for LAA; 2) adopt adaptive threshold, CCAED for LAA increases if collisions happen.

- Jim: It is not so likely LAA will include RTS/CTS, adaptive threshold is worthwhile to study.

Actions Items:

- **Consider location and SINR for users;**
- **Continue study this threshold with adaptive threshold.**

Next meeting: Friday November 20 4:30 - 5:30pm (EDT)